

# Seasonal Patterns in Sea Fleet Gains and Losses

Jeremy A. Arkes • Henry S. Griffis

**Center for Naval Analyses**

4401 Ford Avenue • Alexandria, Virginia 22302-1498

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Donald J. Cymrot, Director  
Workforce, Education and Training Team  
Resource Analysis Division

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# **Seasonal Patterns in Sea Fleet Gains and Losses**

**Jeremy Arkes  
Henry Griffis**

## Objectives

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- **Document pattern of seasonal variation**
- **Determine sources of seasonal variation**
- **Provide policy options to reduce variation**

Historically, the level of fleet manning has varied widely over the course of a year. Arrivals to and departures from the sea fleet have not coincided well, resulting in significant understaffing at certain times of the year. This, of course, affects readiness.

The objective of this report is to recommend policy options to bring about better matching of enlisted sea gains and losses to reduce the seasonal variation in sea manning. We first document the pattern of seasonal variation. We then decompose the transitions to and from the sea fleet to determine the sources of the variation so that we know where to target the policies. Finally, we offer an initial look at certain policies that aim to reduce the seasonal variation.

## Findings

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- **Wide swings in E1-E4 and E5-E9 sea manning**
  - But relatively little seasonal pattern in E5-E9
- **Strength losses at EAOS make largest contribution to seasonal variation among E1-E4s**
- **Several policies seem promising that don't resort to level-loading**

We find substantial variation in sea manning over the course of the year for both E1-E4 and E5-E9 sailors. While a clear seasonal pattern emerges for E1-E4 sailors, we see no such pattern for E5-E9 sailors because there is little difference in the average net gains for the two periods of the year that we separate: June through November and December through May. Furthermore, no three consecutive months are well above or below average net gains for E5-E9 sailors.

The main contributor to the seasonal variation in E1-E4 net gains is strength losses at End of Active Obligated Service dates (EAOSs). While the summer surge of accessions does produce huge seasonal variation in accessions, the staggered training lengths spread the summer surge accessions around, so that the seasonal pattern in sea gains is not as volatile as that for sea losses.

Because strength losses at EAOS contribute the most to seasonal variation in sea manning, we construct several policy options that aim to reduce seasonal variation by shifting these EAOS dates so that they match sea gains more closely.

From simple simulations, it appears that the policy of having a mix of 3.5- and 4.5-year obligations reduces seasonal variation the most. Another alternative involving 3.5-year enlistments for GENDETs and a bonus in exchange for 6-month extensions for non-GENDETs appears to do almost as well.

## Outline

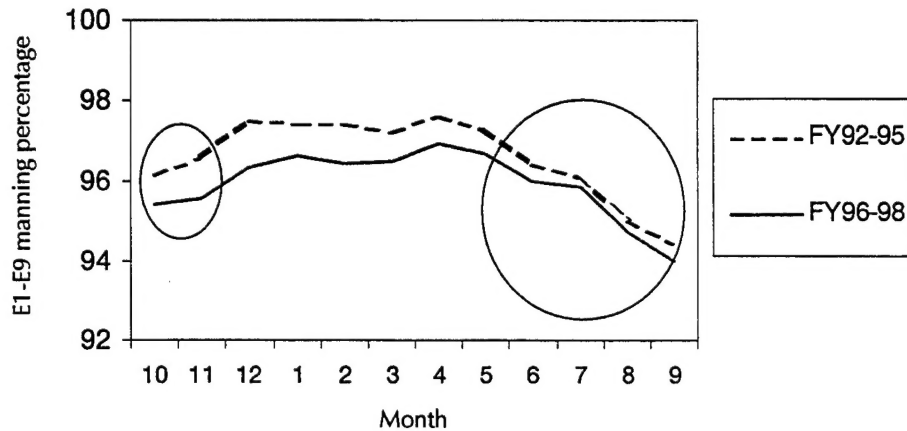
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- ➡ • **Determining seasonal patterns in manning relative to billets authorized**
- **Tracking seasonal patterns in sea fleet gains and losses**
- **Analyzing policy options to reduce seasonal variation**

We begin by examining how much of a seasonal pattern exists in sea manning. We use manning as a percentage of billets authorized to construct this measure.

## Fleet Manning is Lower in Jun-Nov

### E1-E9 Fleet Manning as a Percentage of Billets Authorized



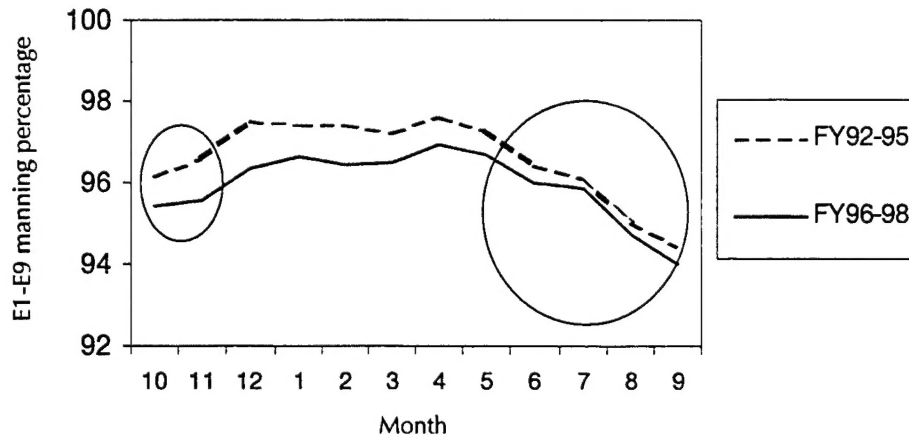
This graph shows the seasonal trends in sea manning as a percentage of billets authorized. We use Enlisted Master Record (EMR) data and the Navy's Enlisted Billet File to construct the manning variable. Because our billets authorized data only go back to 1991 and because Desert Shield/Desert Storm occurred in 1991, we decided to start measuring seasonal trends in FY92. We separate the data into two periods: FY92-95, a period of significant drawdown and few recruiting problems; and FY96-98, a period of less drawdown and more recruiting problems.

The advantage of this measurement over absolute manning levels is that it corrects for the drawdown because the number of billets authorized reflects how much the Navy planned to reduce its strength. A line representing the seasonal pattern in absolute manning levels would have a downward trend over the course of the year in the two periods because of the drawdown. And this downward trend would incorrectly indicate the existence of a seasonal pattern, probably to a greater extent in FY92-95 when the drawdown was in full force. This steeper downward trend in FY92-95 could be mistaken for a more significant seasonal trend. The seasonal pattern in manning as a percentage of billets authorized, on the other hand, will have seasonal variation only in terms of how well the Navy is filling its billets at different times of the year. A value of 100 indicates that staffing is at the planned level. The finding that the line for FY96-98 is lower than the line for FY92-95 indicates that the Navy had a harder time filling its enlisted sea billets in the latter years.



## Fleet Manning is Lower in Jun-Nov (continued)

**E1-E9 Fleet Manning as a Percentage of Billets Authorized**



Instead of using actual billets authorized to calculate the ratio, we used fitted values, assuming a constant rate of decline in billets authorized throughout a given year. We did this because actual billets authorized had systemic patterns in the month-to-month changes over the course of the year. Specifically, April and June had twice the average monthly change from the previous month, while September had five times the average change. This volatility could produce large changes in manning levels divided by billets authorized. Thus, we use the trended (smoothed out) values.

The manning level as a percentage of billets authorized was more volatile in FY92-95. This could have been caused by the drawdown being more rapid in this period, which could produce more volatile adjustments.

The important point from the chart is that a lower percentage of the billets was filled between June and November than between December and May. Because of this finding, we will consider seasonal variation in the rest of this analysis as the difference between these two periods. The two periods actually make a nice division because the summer-surge months are June to September while the low months for accessions are February to May.

## Outline

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- **Determining seasonal patterns in manning relative to billets authorized**
- ➡ • **Tracking seasonal patterns in sea fleet gains and losses**
- **Analyzing policy options to reduce seasonal variation**

Now that we have established the presence of some degree of seasonal variation in manning relative to billets authorized, we turn to a more detailed examination of seasonal variation in transitions to and from the sea fleet to determine the source of the variation.

## Methodology

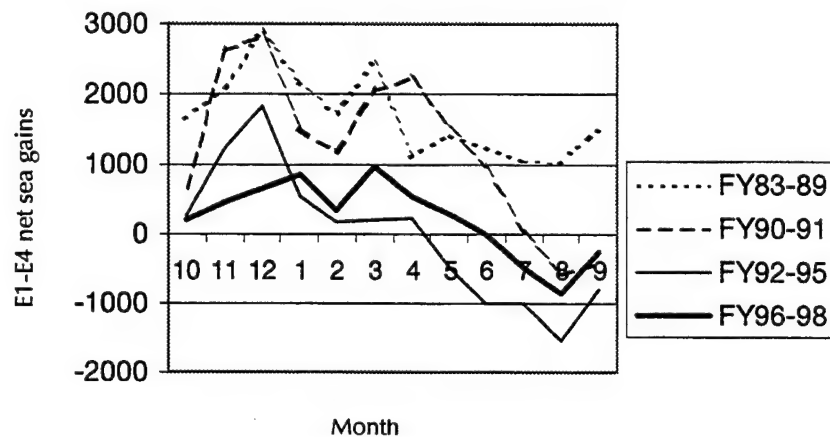
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- **Determine whether sea manning gains and/or losses are seasonal**
  - Seasons defined as Jun-Nov and Dec-May
- **Determine the source of the seasonality**
- **Consider 4 periods separately:**
  - FY83-89: Pre-DS/DS, stable, slow growth
  - FY90-91: Possible DS/DS effects
  - FY92-95: Early drawdown
  - FY96-98: Late drawdown, recruiting problems

To determine the sources of the seasonal variation in manning, we shift the focus from the manning levels to the movement of bodies. We first track seasonal patterns in sea fleet gains and losses to see which drive the seasonality. We then separate the gains and losses into categories to determine the sources of the seasonal patterns of transitions to and from the sea fleet.

We have data from FY83 through FY98. We use the same two periods (FY92-95 and FY96-98) we already established in the analysis. In addition, we divide FY83-FY91 into two periods: FY83-89, the period before Desert Shield/Desert Storm (DS/DS), which was characterized by slow, stable growth in the size of the Navy; and FY90-91, portions of which may have been affected by DS/DS.

## E1-E4 Net Sea Gains Generally Decline from Spring to Summer



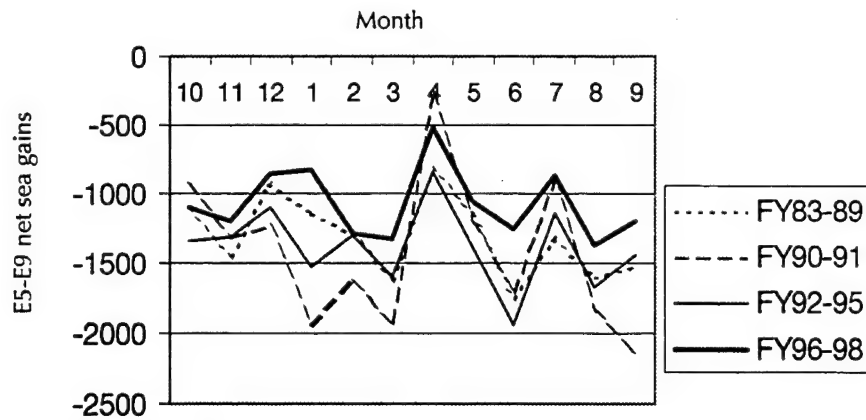
Note: Net gains do not count advancements to E5 as a loss.

This graph shows the net gains to the sea fleet for E1-E4 sailors. The fact that the net gains are mostly positive does not indicate that the sea fleet is growing for E1-E4 sailors because the net gains do not include E4 advancements to E5. Thus, someone who comes to sea as an E3 and leaves as an E5 would be counted as an E1-E4 gain to sea in this figure and an E5-E9 loss to sea in the figure on the next page.

Net sea gains (gains minus losses) are consistently lower in June to September, especially in the more recent periods. This is consistent with our earlier finding that sea manning is lowest in June to November. The smaller number of net sea gains in June to September drives manning down, and it takes a few months for manning to recover from its August trough. Overall, average monthly net gains are 766 higher in December to May than June to November for FY96-98.

After a look at E5-E9 net sea gains, we will separate the E1-E4 net sea gains into gross sea gains and sea losses.

## Relatively Little Seasonality in E5-E9 Net Sea Gains



**Note: Net gains do not count advancements from E4 as a gain.**

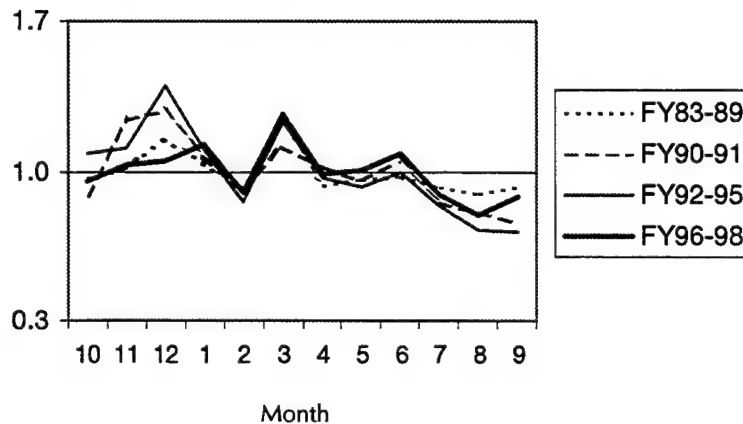
Not counting advancements to E5 resulted in an overstatement of E1-E4 net gains. Likewise, E5-E9 net gains are understated because they do not count advancements from E4. For example, if someone arrives at sea duty as an E4 and leaves as an E6, we would count that sailor as an E5-E9 sea loss and not as an E5-E9 sea gain.

While we see wide swings in E5-E9 net gains, the difference between the average net gains for the December-May and June-November periods is relatively small. Furthermore, no three consecutive months are much higher or lower than the average, at least for the FY92-95 and the FY96-98 periods, and there does not appear to be an upward or downward trend over the course of the fiscal year. One may argue that the consistency of the peaks across the four periods indicates a seasonal pattern; however, because the seasonal variation in E5-E9s is relatively small according to our seasonality measure, we will concentrate our policies on the seasonal patterns of E1-E4 sailors.

The breakdown of E5-E9 net sea gains into gains, losses, and their components is in appendix A. One interesting feature of the E5-E9 net sea gains is how high the month of April is. In appendix A, we discuss the role of seasonal shortfalls in permanent-change-of-station (PCS) funding of sailors' moves from sea to shore as a possible explanation of the April spike.

## Average Monthly E1-E4 Sea Fleet Gains

Deviations from the mean (mean = 1.0)

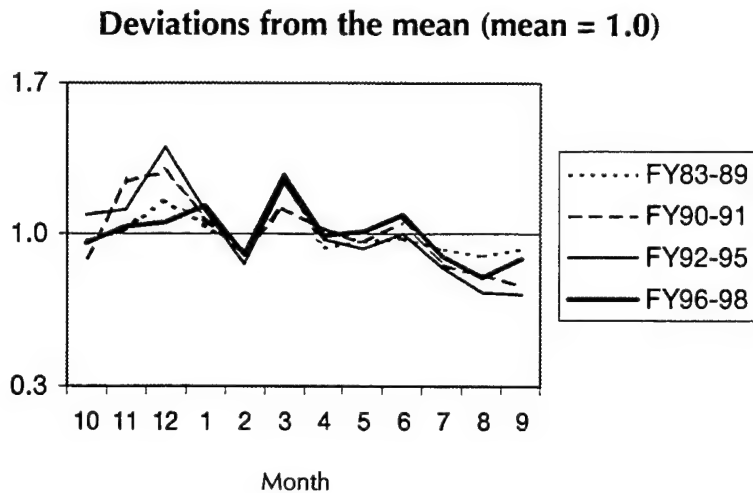


We now show the components of net gains for E1-E4 sailors. This graph shows sea fleet gains normalized so that the mean across the fiscal year is equal to 1. This allows one to more easily gauge the percentage deviation from the mean, and it makes similarities or differences across different periods easier to detect.

The seasonal patterns in E1-E4 sea gains have remained quite similar across the four periods. Sea gains tend to be higher from November to January, drop in February, increase in March, drop to the average in April through June, and decrease below average in July to September.

The February drop in sea gains relative to January and March is driven primarily by the arrival of sailors from initial skills training into the fleet. It occurs for both GENDETs and non-GENDETs (see the first two pages of appendix B). The fact that February has about 10 percent fewer days than January and March explains part of this. Another contributor to this pattern (for new sailors) is the stand-down in post-boot-camp training around the holidays in December. Classes do not start in the latter weeks of December, and classes that are ongoing take 2 weeks off in that period. Thus, GENDETs will have extra 3-week apprentice training courses starting at the beginning of January, and ending later in January, causing extra sailors to arrive at their sea billets in January. A similar pattern occurs for non-GENDETs, but, because their pipelines are longer, it causes extra sailors to arrive in March.

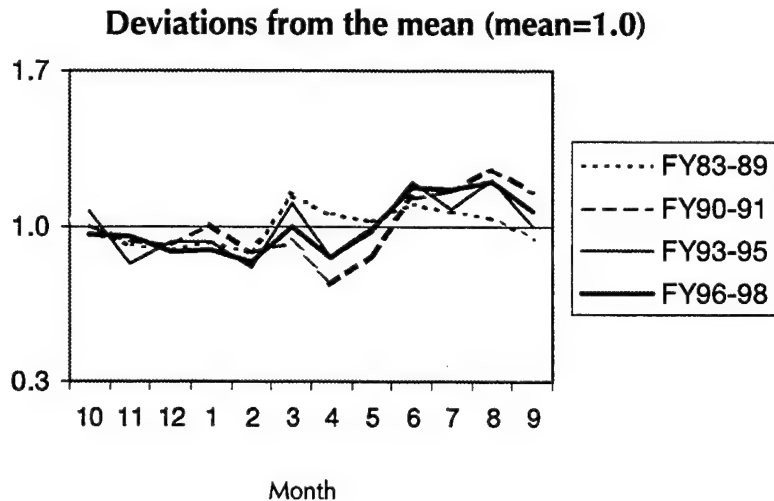
## Average Monthly E1-E4 Sea Fleet Gains (Continued)



The driving force behind the dropoff in the summer months in sea gains is the combination of summer-surge accessions and training lengths. A little over one-half of accessions reach the fleet in 4 to 7 months, with the rest having staggered training lengths, diffusing the sea gains over the course of a year. This means that additions to the sea fleet will be higher 4 to 7 months after the June-September summer-surge of accessions. At the same time, there are fewer additions to the sea fleet 4 to 7 months after the February-March-April-May (FMAM) period. Because of the (small) FMAM cohort reaching the fleet in the summer months and because the summer-surge accessions are still in training in the summer, sea fleet gains are lower in the summer months.

The absolute difference in average monthly sea gains between December-May and June-November is 328, which explains less than one-half of the 766 difference in net E1-E4 sea gains. Thus, sea fleet losses must explain more than half the difference.

## Average Monthly E1-E4 Sea Fleet Losses

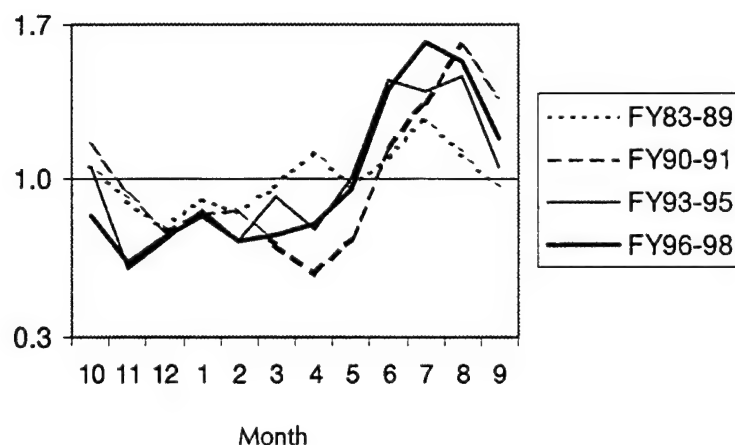


Sea fleet losses have nearly the opposite pattern to sea fleet gains. Losses are generally lower during October through April, and they are higher in June through September. Because net gains equal gains minus losses, this also causes net gains to be lower in June through September. The difference in average monthly sea losses between December-May and June-November is 439—about one-third higher than the absolute difference for sea gains. The next slide shows the primary source of the seasonal variation in sea fleet losses.



## Average Monthly E1-E4 Sea Fleet Losses at EAOS

Deviations from the mean (mean = 1.0)



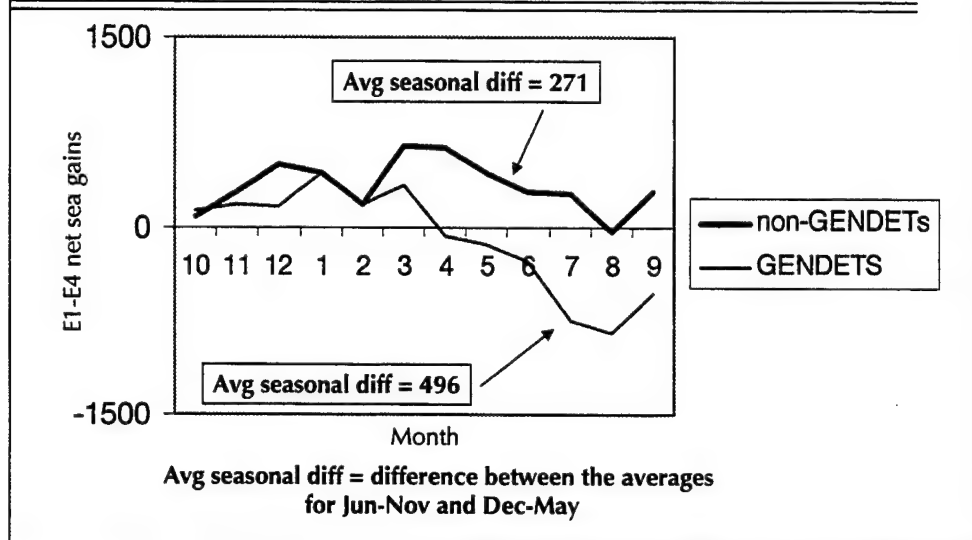
Note: These do not include losses after an extension.

This graph shows the seasonal patterns for sea losses due to strength losses at EAOS after an enlistment, the largest contributor to the seasonal variation for sea losses and net sea gains. The rest of the major components of E1-E4 sea gains and losses, along with decompositions of how much each component contributes to the seasonal variation are in appendix B (pages 44-51). Losses to shore actually make up a larger part of all sea losses, but the seasonal pattern in losses to shore is very slight.

The strength losses at EAOS after an enlistment include those who are leaving no more than 3 months before their EAOS date after an enlistment or long-term extension of at least 24 months. They do not include sailors who make short-term extensions. The seasonal pattern for sailors with short-term extensions is shown on page 48 of appendix B.

While the average monthly June-November EAOS losses exceeded the December-May average monthly losses after enlistment by 13 percent in the 1980s, the difference was 47 percent in FY96-98.

## Much More Seasonal Variation Among GENDETs



Next, we present net sea gains for GENDETs and non-GENDETs separately. Specifically, this chart compares the seasonal pattern for sailors who were GENDETs at the start of their sea tour with the seasonal pattern for sailors who were non-GENDETs. Thus, a sea loss by a GENDET who subsequently struck for a rating before leaving sea duty is reflected in the GENDET line.

Although there are many more non-GENDETs, the seasonal variation, measured as the difference in average monthly net gains between the June-November period and the December-May period, is much greater for GENDETs. This is partly attributable to the lower first-term retention for GENDETs, which produces more losses at EAOS in the summer months. In addition, it may be in part attributable to the Navy putting more effort into level-loading non-GENDETs.

The higher seasonality for GENDETs suggests that a policy aimed toward reducing seasonal variation for GENDETs could produce a significant reduction in the overall seasonality of sea manning. However, it would not solve the problem of seasonal variation within individual ratings.

## **Seasonal Patterns (FY96-98)**

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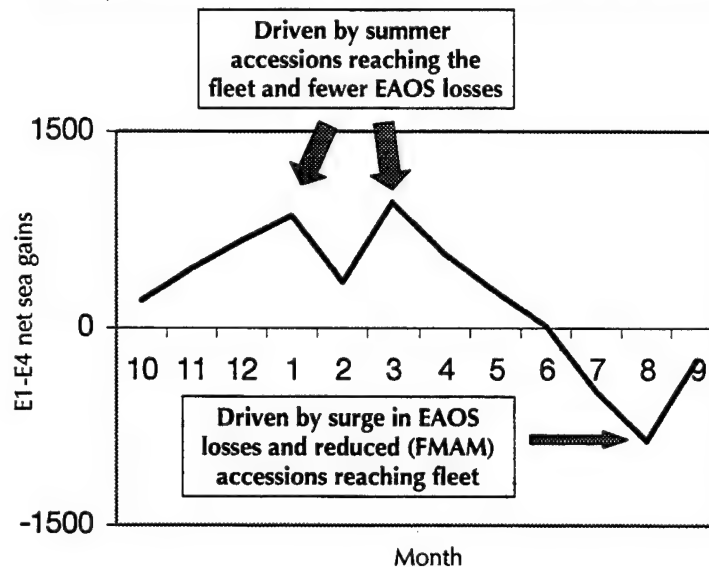
- **E1-E4s are the major source of seasonal variation**
- **E5-E9s have wide swings, but little seasonal pattern**
- **Rotation to and from shore not major source of seasonal variation for E1-E4 or E5-E9**

This slide highlights the important points from the patterns for sea gains and losses. For E1-E4 sailors, net sea gains are lowest in June through September. This pattern causes overall sea manning to be consistently lower each June to November within E1-E4. The biggest cause is EAOSs coming up in the summer months (reflecting the summer surge in accessions that occurred 3 to 6 years prior). The seasonal variation is more marked for GENDETs than for non-GENDETs.

For E5-E9 sailors, we see wide swings throughout the year but little seasonal pattern.

Rotations to and from shore are quite volatile throughout the year, but they are not major contributors to the seasonal patterns. The charts of monthly net gains to and from shore for both paygrade groups are in the appendixes.

## E1-E4 Seasonal Patterns (FY96-98)



This chart highlights the most recent FY96-98 trends in net gains for E1-E4 sailors, along with the sources of the large deviations. The high net gains in the October-May period are driven by the summer accessions reaching the fleet and fewer EAOS losses because accessions are lower at that time of the year.

In the summer months, sea gains are lower because the (low number of) FMAM accessions are reaching the fleet, and sea losses are higher because sailors who accessed in the summer are reaching their EAOSs.

We will use this chart to compare the simulated net gains resulting from the policy options to the actual net gains.

## Outline

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- **Determining seasonal patterns in manning relative to billets authorized**
- **Tracking seasonal patterns in sea fleet gains and losses**
- ➡ • **Analyzing policy options to reduce seasonal variation**

We now turn to an analysis of the various policy options intended to reduce the seasonal variation in sea manning.

## **Policies to Reduce Seasonal Variation**

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- **Policies to level-load accessions and, thus, level out EAOS losses**
  - Expansion of targeted enlistment bonus program
  - Increased number of recruiters in FMAM
- **Policies to shift seasonal pattern of losses to coincide with sea gains**
  - ➡ – 3- and 4-year obligation after initial training
  - ➡ – 3.5- and 4.5-year initial enlistments
  - ➡ – 3.5-year obligation for GENDETs only
  - ➡ – Bonus for 6-month extension offered at LOS 24

Two types of policies would reduce seasonal variation in sea fleet net gains and, therefore, in sea manning. The first type aims to smooth out the number of accessions throughout the year. Level-loading accessions would likely reduce a similar amount of seasonal variation in sea losses as well because EAOSs would be more scattered throughout the year. Two policy options using this strategy would be to expand the current program of Targeted Enlistment Bonuses or to increase the number of production recruiters in FMAM. Both policies would aim to boost the number of accessions in FMAM.

The other type of policy would address the seasonality of manning by shifting the sea losses so they more closely match the seasonal pattern in sea gains. From our analysis, it appears that the best way to do this is to shift EAOSs so that they are not concentrated in the summer months. Our four policy options that shift EAOS losses are:

- Making the initial obligation 3 or 4 years after completing one's initial training
- Having 3.5- and 4.5-year initial enlistments replace 4-year obligations
- Having a 3.5-year initial enlistment for GENDETs only
- Offering a bonus, at 24 months of service, for sailors to extend their initial enlistment by 6 months

For the purposes of this analysis, we focus only on these four policy options. The tradeoffs between summer surge and level-loading involve more issues than the seasonal variation in manning—namely, the cost efficiencies of summer surge to Navy Recruiting Command, the cost efficiencies of level-loading to Navy Training Command, and the different implications for MPN costs under the two alternatives. We will examine these issues in a separate analysis.

## **Policy 1: 4-Year Obligations After Initial Training (Aviator Model)**

- **Pros**
  - People leaving Navy would leave sea in the same month they come in
  - One single policy provides rating-specific solution
- **Cons**
  - Will hurt recruiting
    - Longer obligations--concern about other-service competition
    - Could use mix of 3- and 4-year obligations, requiring change in EB/signing bonus law
    - Concern about recruiters having to sell obligations of uncertain and variable length
- **Simulation indicates 60% reduction in E1-E4 seasonal variation**
  - 50% reduction in overall seasonality

The first policy option we consider is similar to the current policy for naval aviators. A sailor's obligation would start when he or she completes initial-skills training. The policy entails having an integer-number of years of obligation after training, so that EAOSs will occur in roughly the same month that the sailors arrived at the sea fleet. Of course, this will not eliminate the seasonality of net gains because many sailors reenlist and many leave the sea fleet for reasons other than leaving the Navy at their EAOSs. But, overall, the pattern of EAOS losses should more closely correspond to the pattern of sea fleet gains.

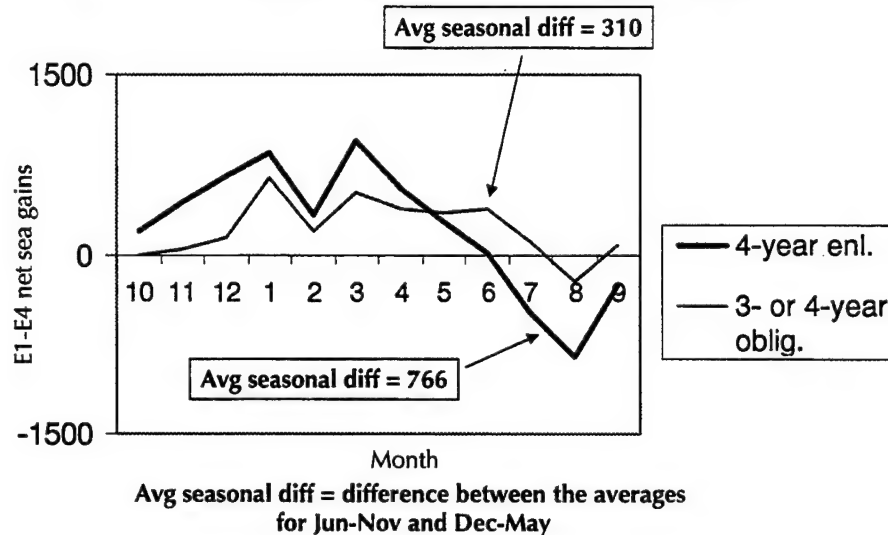
This policy reduces the seasonal pattern for each rating because every sailor's EAOS comes at the same time he or she entered the sea fleet. Thus, if the seasonal patterns of accessions and sea fleet gains for a particular rating remain constant over time, sea fleet losses due to EAOS losses should more closely match sea fleet gains for that rating.

While it may seem reasonable to base the obligation on productive time served, recruiting experts believe that this policy will severely hurt recruiting. Many obligations would not only be longer but also be of uncertain length. And a recruiter from one of the other services would likely point out these facts to a potential recruit. To counteract the damage to recruiting, this policy could entail a mix of 3- and 4-year obligations after training rather than just 4-year obligations. But this has its own downside: current law does not allow the Navy to offer an enlistment or signing bonus to recruits with less than 4-year enlistments.

Other problems could arise after implementing such a policy. For example, each day that a sailor spends awaiting instruction would push forward his or her EAOS by a day.

A simulation of this policy suggests that it would reduce the E1-E4 seasonal variation, as measured by the difference in net gains between the June-November and December-May period, by about 60 percent. It would reduce total seasonal variation (E1-E9) by about 50 percent.

## Simulation With 4-Year Obligation After Initial Training: FY96-98



Here, we simulate the impact of this policy. The thicker line represents the actual net gains for FY96-98, while the thinner line represents a prediction of what net gains would have been with this policy in place. For E1-E4 sailors whose sea loss was the result of leaving the Navy at their EAOS, we had them leave the Navy the same month that they arrived to the sea fleet.

Possible secondary effects of the policy might include increasing attrition, decreasing reenlistment rates, and the recruiting problems mentioned earlier. However, we are uncertain whether these secondary effects would occur and how extensive they would be. This simulation does not model potential secondary effects.

The simulation suggests that the policy would reduce the difference in average monthly net gains between June-November and December-May from 766 to 310, a reduction of about 60 percent. If we include the E5-E9 difference in average net gains between the two periods of 188, the total reduction is roughly 50 percent (from 954 to 498).



## Policy 2: 4.5-Year Enlistments

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- **Pros**
  - Median time to reach sea fleet  $\approx$  6 months
- **Cons**
  - Will hurt recruiting
    - Longer obligations--concern about other-service competition
    - Could use mix of 3.5- and 4.5-year enlistments, requiring change in EB/signing bonus law
  - May solve variation in aggregate manning, but doesn't solve rating-specific problems
- **Simulation indicates 85% reduction in E1-E4 seasonal variation**
  - 70% reduction in overall seasonality

The next policy option for shifting sea losses to match sea gains is to mandate 4.5-year enlistments instead of 4-year enlistments. This would shift the EAOSs for summer accessions by 6 months, so that the EAOS (sea) losses are not concentrated at the time in which sea gains are low, as is currently the case.

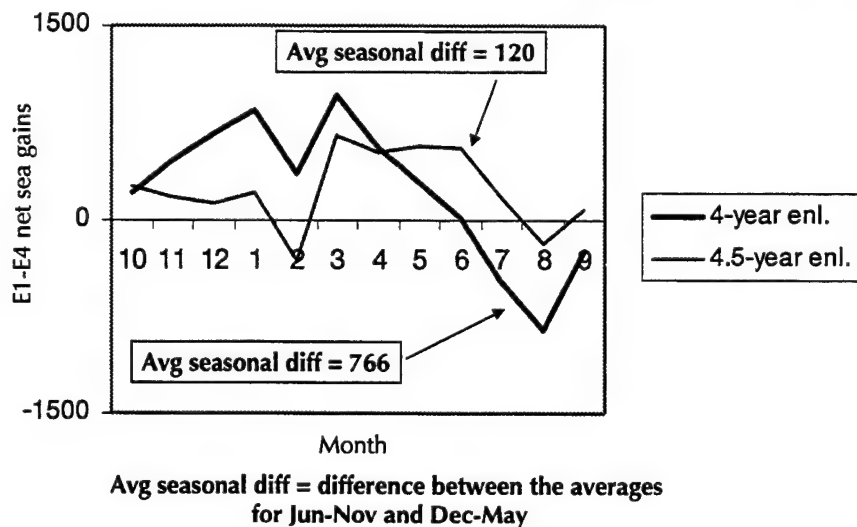
As with the previous policy option, this one could hurt recruiting by requiring a greater obligation. To counteract this effect, the Navy could offer a mix of 3.5- and 4.5-year obligations, having the 4.5-year obligations for ratings for which the training provided is a recruiting selling point. Also, enlistment bonuses—which can't be given for 3.5-year enlistments—remain a problem.

Another important shortcoming of this policy is that it addresses only the aggregate seasonal variation problem, but does nothing for any problem within ratings.

One could also argue that, if you push EAOSs to non-summer months, many sailors would extend to the summer months, mitigating the intended shift of EAOSs. However, the extension behavior of December-May accessions is similar to that of June-November accessions. Thus, we would not expect the policy to change extension decisions (see p. 52 in appendix B).

This policy option appears to be the most effective in reducing the seasonal variation. Our simulation, shown on the next slide, suggests that the policy would reduce E1-E4 seasonal variation by about 85 percent. It would reduce total seasonal variation (E1-E9) by about 70 percent. Of course, its potential value in reducing seasonal variation in manning has to be weighed against its potential impact on recruiting.

## Simulation With a Mix of 3.5- and 4.5-Year Enlistments: FY96-98



This graph shows a simulation of the impact of this policy on net sea fleet gains. Here, the thinner line represents what the E1-E4 net sea gains would be if all 4-year enlistments became 4.5-year enlistments. This simulation does not model any secondary effects, as mentioned with the last policy option. We further assume that attriters still leave at the same time. Essentially, we push the EAOS up (or back) 6 months for all sailors who left at their EAOS.

In the simulation, we make the assumption that sailors would extend at the same rate and for the same number of months under the new scenario as they currently do. Under this assumption, the time of the year is irrelevant to the extension decision. This appears to be a reasonable assumption given current extension patterns (see page 52 in appendix B).

We predict that this policy would reduce the E1-E4 seasonal variation by about 80 percent.

## **Policy 3: 3.5-Year Enlistments for GENDETs Only**

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- **Pros**
  - GENDETs cause larger share of seasonal variation
  - Won't hurt recruiting as much (may even help)
- **Cons**
  - Solves less of the variation in aggregate manning, and doesn't solve rating-specific problems
  - Gives GENDETs less time to strike for rating
- **Simulation indicates 50% reduction in E1-E4 seasonal variation**
  - 40% reduction in overall seasonality

The next policy option would reduce overall seasonal variation by targeting sailors who enter their sea tour as GENDETs because they have had significantly higher seasonal variation than non-GENDETs. It entails having a 3.5-year enlistment for GENDETs instead of the current mix of 4-year and 3-year enlistments.<sup>1</sup>

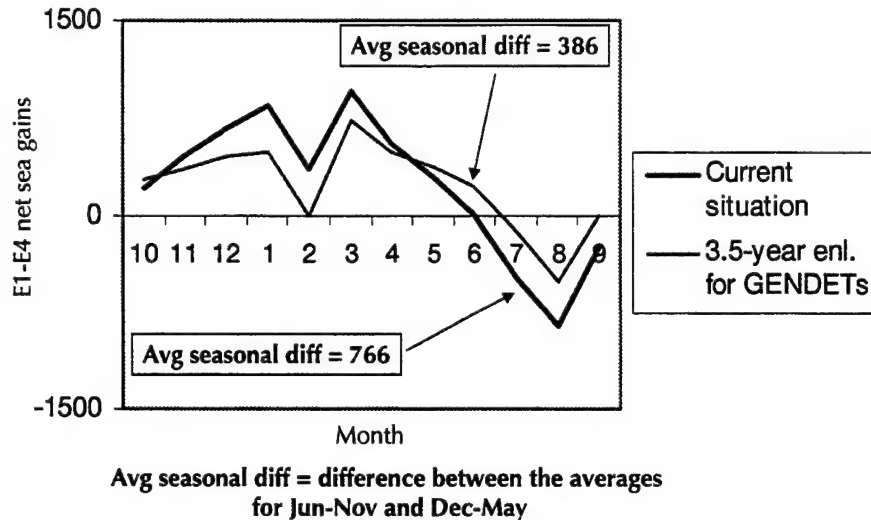
This probably would not hurt recruiting as much as the other policies because it reduces the obligation for many GENDET recruits. However, this policy addresses seasonal variation only in GENDET manning, so there could still be problems within ratings. Another potential pitfall is that the shorter enlistment would give GENDETs less time to strike for a rating, which could hurt retention.

The simulation predicts that this policy would reduce aggregate E1-E4 seasonal variation by about 50 percent. Thus, this policy would reduce total seasonal variation (E1-E9) by about 40 percent.

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<sup>1</sup> The Navy also offers 2-year GENDET enlistments, but these make up only 4 percent of FY96-98 GENDET accessions.

## Simulation With 3.5-Year Enlistments for GENDETs: FY96-98



In the simulation for this policy, we subtract (or add) 6 months to the enlistment for all sailors who enter as GENDETs. This changes by 6 months the loss month for those leaving the Navy when they reach EAOS.

Some sailors who are recruited as GENDETs are reclassified into an A-school, some are sent back to an A-school from the fleet, some strike for a rating, and some remain as GENDETs. In the cases where the GENDET receives a rating, we assume that the Navy either leaves their term of enlistment at 3.5 years or requests a 1-year extension in exchange for the training.

The simulation predicts that the policy would reduce E1-E4 seasonal variation by about 50 percent.

## **Policy 4: 6-Month Extension Bonus Offered at 12 to 24 Months of Service**

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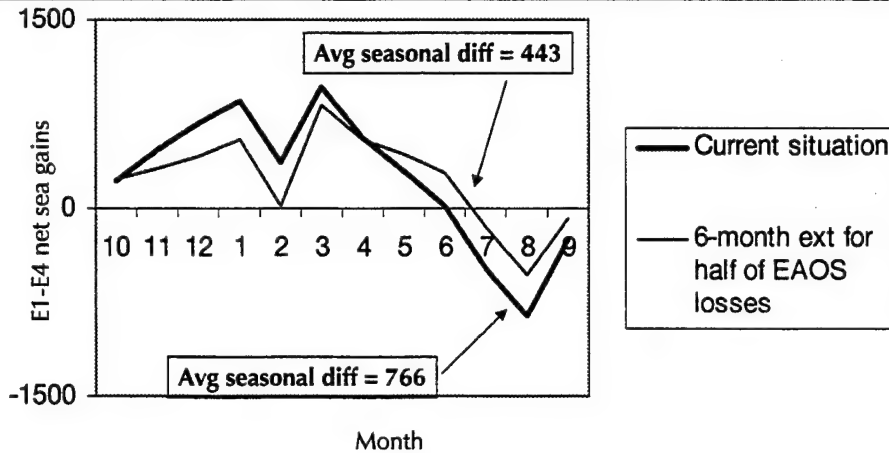
- **Pros**
  - Doesn't place any burden/change on recruiting
- **Cons**
  - Cost of the extension bonus
  - Some uncertainty about how many extensions it would generate
- **Simulation (assuming that one-half take bonus) indicates 40% reduction in E1-E4 seasonal variation**
  - 35% reduction in overall seasonality

The next policy option we consider is offering a bonus at the 24-month point for 6-month extensions. Just as the policy mandating 3.5- and 4.5-year enlistments shifts EAOSs away from the time of the year when sea gains are low, so does this policy. But the advantage over the other policy is that this would not hurt recruiting. Furthermore, there could be an advantage of offering the bonus early in the first term rather than at EAOSs: providing the option of a bonus early on may serve to retain some sailors who would otherwise decide to attrite.

One partially unknown aspect of this policy is how responsive sailors would be to different bonuses. Thus, we do not know precisely how much the program would cost. However, we can gauge a ballpark figure for the costs from the results of previous analyses. Survey data of sailors suggest that a bonus of about \$1,000 could have the effect of inducing about one-half of the sailors to add a 6-month extension to the end of their EAOSs. If the Navy brings in 55,000 annual accessions and if about 75 percent are still in the Navy at the point the extension bonus would be offered, a \$1,000 bonus would induce roughly 20,000 to extend 6 months. Thus, besides the manpower costs, this policy would cost about \$20 million per year.

We perform a simulation in which we assume that the bonus is set so that one-half of sailors leaving at EAOS take the bonus and extend for 6 months. The simulation predicts that the E1-E4 seasonal variation would decrease by about 40 percent. Thus, the policy would reduce total seasonal variation by about 35 percent.

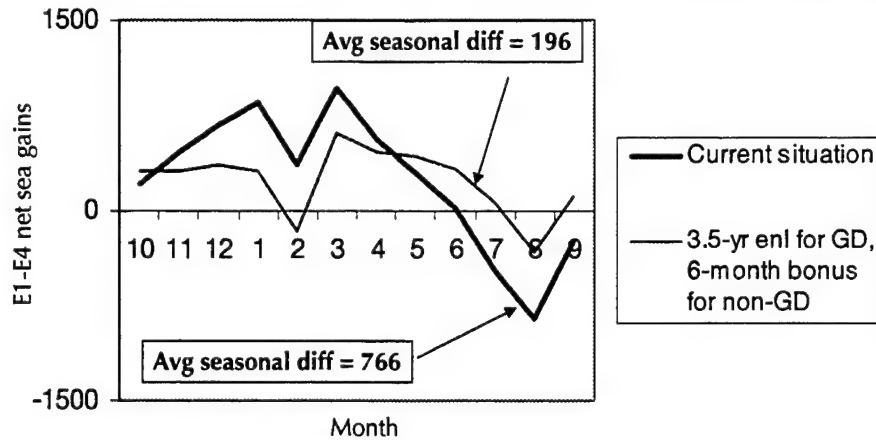
## Simulation With 6-Month Extension for Half of All EAOS Losses: FY96-98



Avg seasonal diff = difference between the averages for Jun-Nov and Dec-May  
EAOS losses include losses at EAOS after an enlistment or an extension.

As mentioned on the previous page, we assume that the bonus is set so that one-half of EAOS losses take the bonus and extend 6 months. The simulation shows that the difference in E1-E4 net gains between the June-November period and the December-May period decreases from 766 to 443 with the new policy, a 40-percent reduction.

## Simulation With 6-Month Ext. for Half of Non-GD EAOS Losses and 3.5-Yr Enl. For GD: FY96-98



Avg seasonal diff = difference between the averages for Jun-Nov and Dec-May  
EAOS losses include losses at EAOS after an enlistment or an extension

Now that we have examined four policies, we present here another option, which has a mix of two of the previous policies. This one entails a 3.5-year enlistment for GENDETs and a 6-month extension bonus for non-GENDETs. Assuming that the bonus amount is set so that about one-half of all non-GENDETs take the bonus, the simulation predicts that this policy would reduce E1-E4 seasonal variation by about 75 percent and E1-E9 seasonal variation by about 60 percent.

## Summary of the Policy Options

<u>Policy Option</u>	<u>% Reduction in E1-E9 seas. var.</u>	<u>Solves within- rating seas. var.</u>
Oblig. after training	50	yes
3.5- & 4.5-yr enlistments	70	no
3.5-yr enlistment for GD	40	no
6-month extension bonus	35	no
3.5-yr enlistment for GD & 6-mo. ext. bonus for non-GD	60	no

This slide provides a summary of the policy options we developed. The ones that would reduce the seasonal variation the most are the 3.5- and 4.5-year enlistments and the combination of the 3.5-year enlistment for GENDETs and the 6-month extension bonus for non-GENDETs. However, the only policy that addresses within-rating seasonal variation is the one that has the obligation start after training.



## E1-E4 Seasonal Variation By Rating's Training Length

<u>Average training length of rating</u>	<u>Seasonal variation</u>	<u># sea gains and losses</u>	<u>Seas. var./ (gains+losses)</u>
<b>GENDETs</b>	<b>495.5</b>	<b>2,119.3</b>	<b>0.23</b>
<b>Non-GENDETs</b>	<b><u>270.5</u></b>	<b><u>3,183.4</u></b>	<b><u>0.08</u></b>
< 7.5 months	135.9	1,038.4	0.13
7.5-10.5 months	95.5	1,047.8	0.09
10.5-13.5 months	24.5	550.0	0.04
>13.5 months	14.6	547.2	0.03

**Note:** Seasonal variation is measured as the difference in net gains between the December-May period and the June-September period.

This slide shows how much of the seasonal variation comes from ratings of various average training pipeline lengths. In addition to the contribution to the total seasonal variation in the first column, we also have the average annual number of sea gains and losses in the FY96-98 period (to give an indication of the level of flows) and a relative seasonal variation indicator--the amount of seasonal variation divided by the number of sea gains and losses.

The seasonal variation in net sea gains is much higher, even controlling for the amount of sea gains and losses, for GENDETs. Non-GENDETs have a rate of seasonal variation about one-third of that for GENDETs. Among non-GENDETs, higher average training pipeline lengths are associated with less seasonal variation. This is partly because these ratings have a more variable pipeline length among sailors in the ratings, so this has the effect of level-loading the sailors.

## **Rating-Specific Application of Policy 2: 3.5- & 4.5-Year Obligations**

- **Across-the-board policy would worsen seasonal variation within some ratings**
- **Modification of policy 2—apply policy only to ratings that:**
  - **Have less than 7.5 months of average time to fleet**
  - **Have between 7.5 and 10.5 average months to fleet and have less seasonal variation with policy**
- **Effect is a 65% instead of an 85% reduction in aggregate E1-E4 seasonal variation**

While the policy of having 3.5- and 4.5-year initial obligations would reduce overall seasonal variation, it would increase the seasonal variation for certain ratings. That is, for some ratings—mostly those with more sea gains in the summer months—shifting the EAOS forward or backward by 6 months would move sea losses away from the time of the year when the sea gains are higher. This would cause a reverse seasonal variation, where net gains are higher in the June-November period.

As seen on the previous slide, the seasonal variation in net sea gains is relatively minor for non-GENDET ratings with an average training pipeline of more than 10.5 months. It is for these ratings that the policy with 3.5/4.5-year obligations would be more likely to increase seasonal variation. Thus, applying the policy to all ratings would cause more seasonal variation within some ratings.

To address this issue, we simulated a modification of this policy. We imposed the policy just on: (1) ratings with an average training pipeline of less than 7.5 months and (2) ratings with an average training pipeline of 7.5 to 10.5 months if the seasonal variation, either positive or negative according to our measure, was not higher in magnitude with the new policy. Of course, the Navy could evaluate each rating to determine what the effect of the policy would be, but for the sake of simplicity, we just use this general policy modification.

This policy modification keeps individual ratings from having higher seasonal variation. However, the trade-off for limiting increases of seasonal variation within ratings is that overall seasonal variation would increase. The modification would decrease the reduction in E1-E4 seasonal variation from 85 to 65 percent and the reduction in E1-E9 seasonal variation from 70 to 55 percent.

## Conclusions

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- **Much seasonal variation in E1-E4 gains and losses**
  - Little seasonal variation in E5-E9 net gains
- **Strength losses at EAOS make largest contribution to seasonal variation for E1-E4s**
- **Best policies aimed at shifting EAOSs to match fleet departures with fleet arrivals:**
  - Mix of 3.5- and 4.5-year enlistments
  - Combination of 3.5-year enlistment for GENDETs and 6-month extension bonus for non-GENDETs

In this study, we documented the seasonal variation in fleet sea manning, analyzed the causes of the variation, and explored the effectiveness of several potential policies that could reduce the seasonal variation.

We find that net gains for E1-E4s were highly seasonal, with the summer months having much lower net gains than the rest of the year. The seasonal variation was much less for E5-E9s. The driving force behind the seasonal variation for E1-E4s was the summer surge of strength losses when sailors reached their EAOSs.

We analyzed several policies that address the E1-E4 seasonal variation by shifting the surge in EAOSs away from the summer months so that sailors' departures from the fleet will coincide with the arrival of new sailors into the fleet. The policies with the greatest potential to reduce seasonal variation are:

- A mix of 3.5- and 4.5-year enlistments
- A combination of 3.5-year enlistments for GENDETs and a 6-month extension bonus for non-GENDETs offered at 12 to 24 months of service.

## Issues for Further Analysis

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- **Analyze cost/benefit of summer surge versus level-loading accessions**
- **Decide how to shape obligation structure to minimize adverse effect on recruiting**
- **Analyze effect of policies on overall manning levels and work-year cost**
- **Analyze effect of GTAP program to reduce variation in manning**

Before the Navy implements the policy options presented in this analysis, it needs to look closely at several issues. First, the costs and benefits of the strategy of level-loading accessions should be examined as an alternative to the strategy that we present of shifting sailors' EAOSs to match the timing of new arrivals to the fleet. If recruits enter the Navy in a more even stream, sailors would leave the Navy more evenly across the year as well. This is a bigger issue for which seasonal variation in manning is one component. Level-loading hurts the effectiveness of recruiting because it severely limits the number of recent high school graduates the Navy can access in the summer. However, level-loading results in lower training costs because training pipelines wouldn't have to be sized to accommodate the summer surge. We will address this in subsequent analysis.

An implementation issue that will require further study is how to shape the obligation structure if a given policy is chosen. For example, if the Navy chooses to adopt a mix of 3.5- and 4.5-year enlistments, which ratings should the Navy shift to 3.5-year enlistments and which to 4.5-year enlistments? The first factor to consider is the length of sea tours. The Navy would probably want the more sea-intensive ratings to move to 4.5-year enlistments to better align end of obligation with projected rotation date to shore. Another factor to consider would be trying to minimize the impact of the new obligations on recruiting. Perhaps the Navy would choose 4.5-year enlistments for ratings that provide a type of training that proves to be a recruiting selling point. Also requiring further study is the question, what would be the long-run effect of a change in enlistment lengths on yearly accession goal?

## **Issues for Further Analysis (continued)**

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- **Analyze cost/benefit of summer surge versus level-loading accessions**
- **Decide how to shape obligation structure to minimize adverse effect on recruiting**
- **Analyze effect of policies on overall manning levels and work-year cost**
- **Analyze effect of GTAP program to reduce variation in manning**

The shape of the obligation structure would also have implications for MPN costs and endstrength. Because the new policy options shift losses away from the summer months, the average strength level may end up being lower for a given endstrength. Thus, the Navy might have to either raise endstrength goals or deal with reduced average strength levels. We explain this in more detail in appendix D on pages 56-57 .

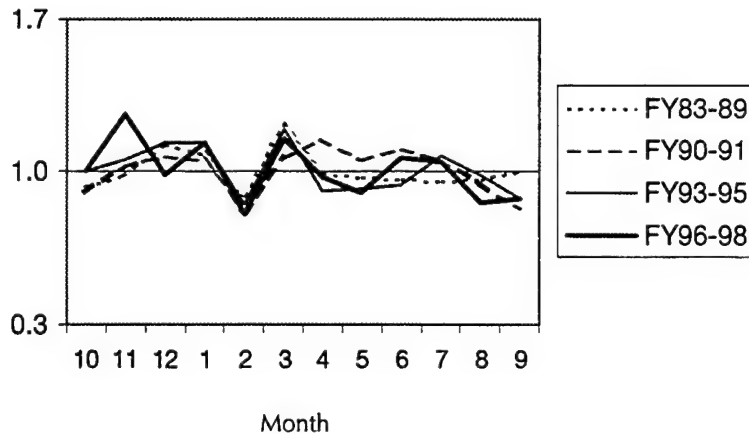
Finally, a couple of pending programs may equalize some of the current variation in sea manning. The first is the GENDET to A-school Program (GTAP), which will send some recruits straight from boot camp to the fleet during the portion of the year that A-schools are crowded, returning them for their guaranteed A-school training later in the year. The second is the Navy's sea pay reform package—including increases in the sea pay table and the introduction of a Sea Tour Extension Program—which would induce some sailors in fleet sea billets to extend their sea duty.

**Appendix A:**

**Additional Data on E5-E9 Sea  
Gains and Sea Losses**

## Average Monthly E5-E9 Sea Fleet Gains

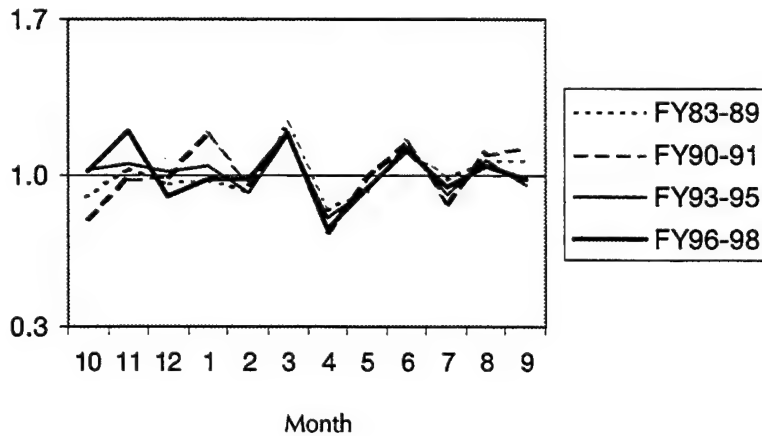
Deviations from the mean (mean = 1.0)



In this slide and the next, we break down the net sea gains for E5-E9s into gains and losses. This slide shows the sea fleet gains. While E5-E9 sea gains are far from steady, there is no apparent seasonal pattern.

## Average Monthly E5-E9 Sea Fleet Losses

Deviations from the mean (mean = 1.0)

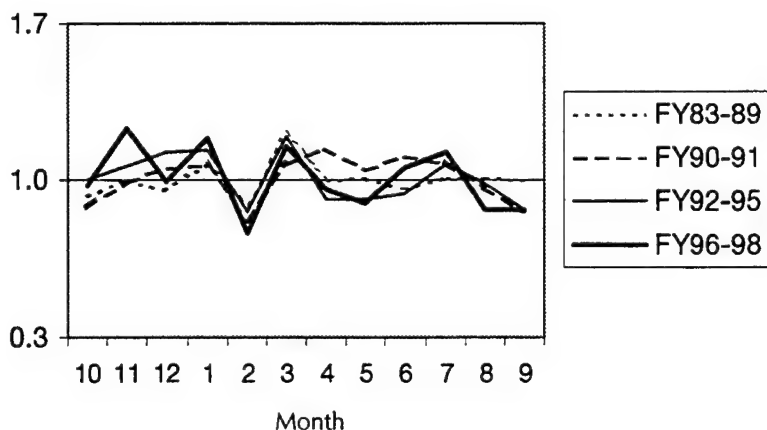


This slide presents the seasonal pattern for E5-E9 sea fleet losses. While there does not appear to be any seasonal pattern, the June-November period does have higher average monthly losses in FY96-98 (by 220) than the December-May period.



## Average Monthly E5-E9 Sea Fleet Gains *from Shore*

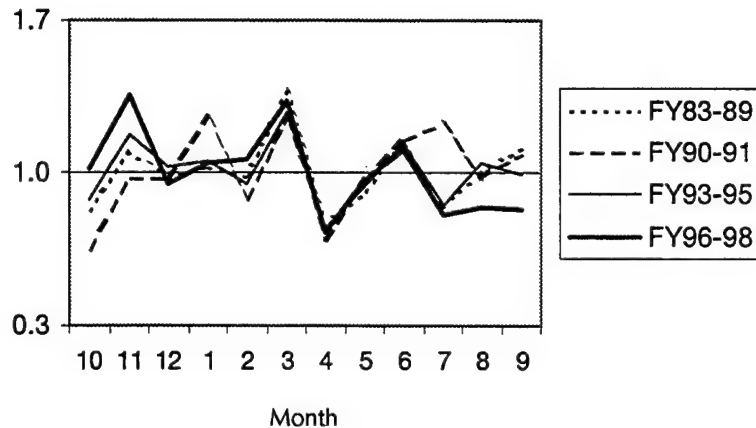
Deviations from the mean (mean = 1.0)



This graph represents the average monthly sea gains from shore for E5-E9 sailors. There is little difference between June-November and December-May, so it contributes little to the seasonal variation.

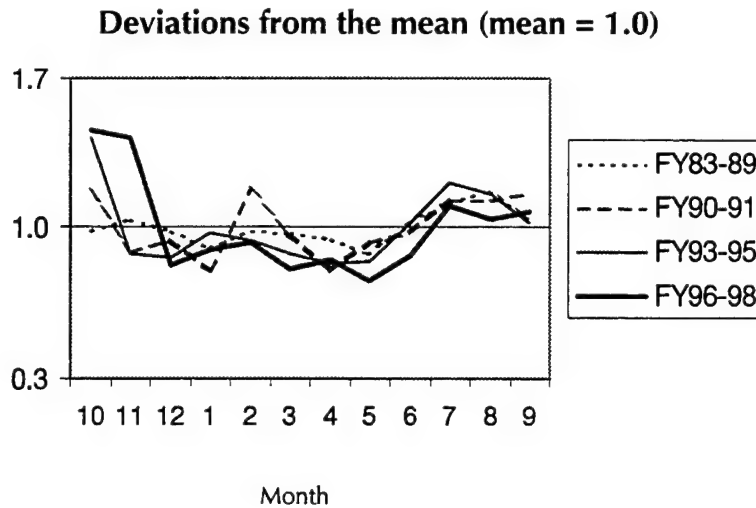
## Average Monthly E5-E9 Sea Fleet Losses *to Shore*

Deviations from the mean (mean = 1.0)



E5-E9 sea losses to shore are quite volatile, but still very little seasonal pattern emerges. It appears that recent PCS funding patterns explain the drop in April: the Navy writes orders for sailors' moves from sea to shore until the available funding is allocated, which has tended to occur by the time the March orders have been written. Order writing then is suspended for a short time until additional PCS funding is made available.

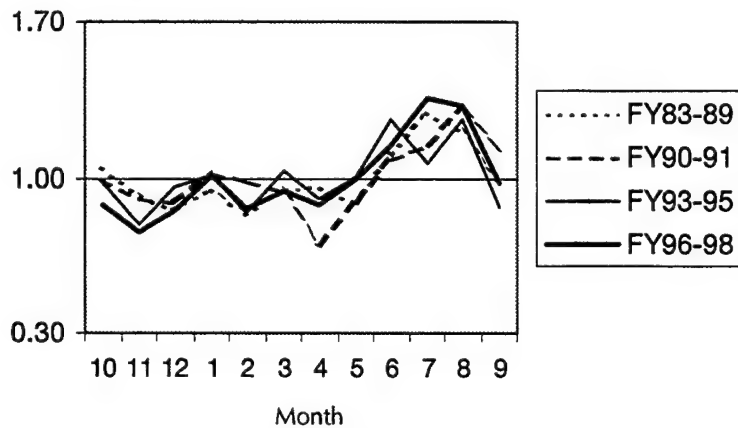
## Average Monthly E5-E9 Sea Losses Due to Retirement



As one might expect, E5-E9 losses due to retirement do follow a seasonal pattern. This is partly because sailors would leave at the point that they become eligible for a certain level of retirement pay. That point (usually the 20- or 30-year point) typically occurs in the summer months, when most accessions occur. The E5-E9 losses due to retirement account for about one-half of the difference in average E5-E9 sea losses between December-May and June-November.

## Average Monthly E5-E9 Sea Losses at EAOS (After an Enlistment)

Deviations from the mean (mean = 1.0)

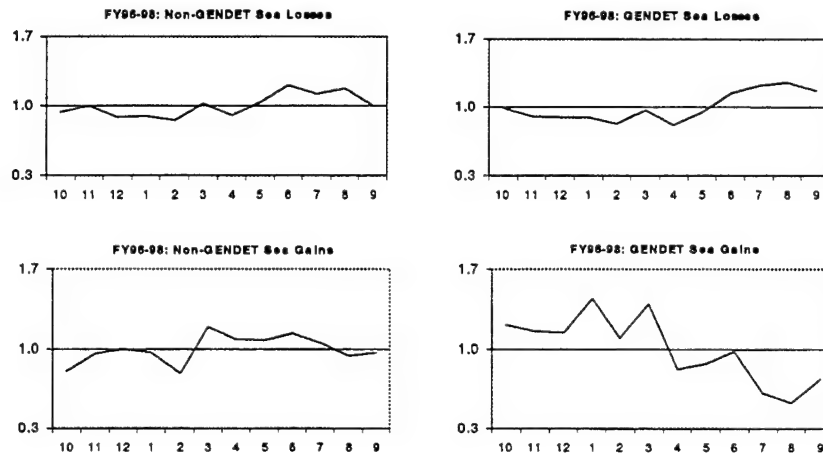


Also as one would expect, E5-E9 sea losses at EAOS are higher in the summer months. However, the lower-than-average values for October and November mitigate the difference between December-May and June-November. Thus, EAOS losses after an enlistment do not contribute much to the seasonal variation as we measure it.

**Appendix B:**

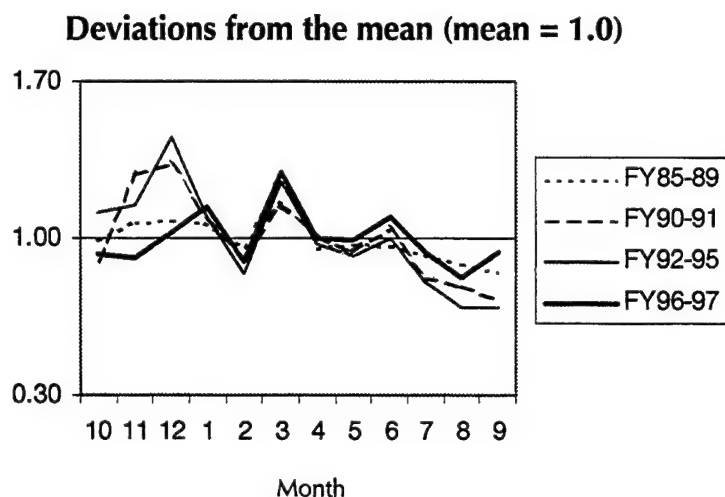
**Additional Data on E1-E4 Sea  
Gains and Sea Losses**

## FY96-98 Sea Gains and Losses By GENDET Status



This slide shows the sea gains and losses for GENDETs and non-GENDETs separately. Both groups have a similar pattern for sea losses, with a surge of losses in the summer months. But the pattern of gains is different for the two groups. This is not surprising since the lengths of training for the two groups have different distributions. Training lengths are less concentrated for non-GENDETs, so their sea gains are more scattered throughout the year. For GENDETs, most sailors arrive at the sea fleet within 3 to 5 months after accession. With the summer surge in accessions, there is a subsequent surge in sea gains for GENDETs in October through March.

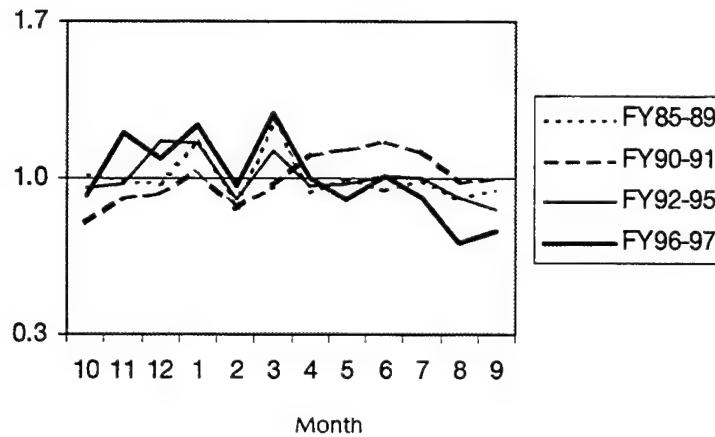
## Average Monthly E1-E4 Sea Fleet Gains *from Training Pipeline*



We now separate the E1-E4 sea gains into those from accession-training and those rotating from shore. Here we have the sea gains coming from accession and initial training. Despite the huge summer-surge of accessions, the sea gains for new sailors are not that volatile. The staggered training lengths help to smooth out their transitions to the sea fleet. There is still, however, the big jump in March and the dropoff in the summer months.

## Average Monthly E1-E4 Sea Fleet Gains *from Shore*

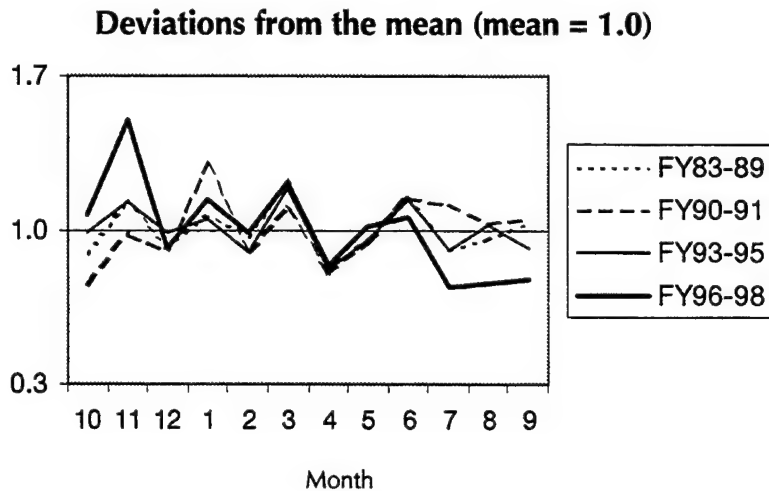
Deviations from the mean (mean = 1.0)



This graph shows E1-E4 sea gains from rotations from a shore tour. We see a dip in the summer months; however, the December-May versus June-November difference is relatively minor, in part because rotations from shore constitute a small portion of total sea fleet gains for E1-E4s.



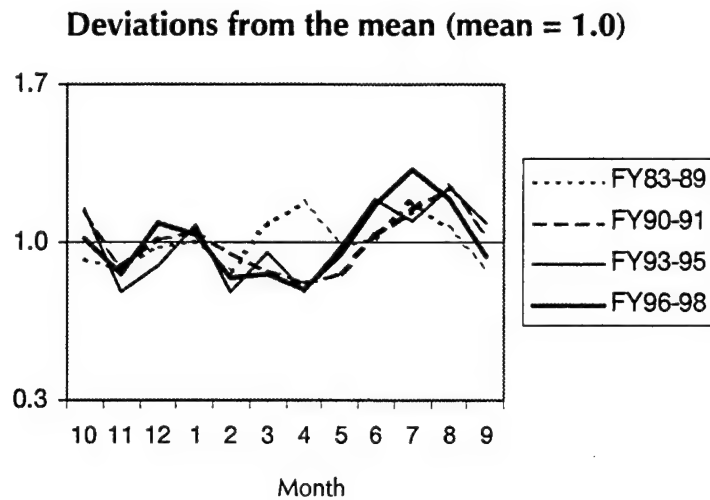
## Average Monthly E1-E4 Sea Fleet Losses *to Shore*



For sea losses stemming from rotations to shore tours, we see a similar dip in the summer months as we observed with sea gains from shore. This is probably because fewer sailors join the sea fleet in the summer months and most sea tours are 36, 48, or 60 months, so sailors would tend to rotate to shore the same month they arrive at their sea tours.

Despite the dropoff in the summer months, the seasonal pattern contributes very little to the seasonal pattern in sea losses.

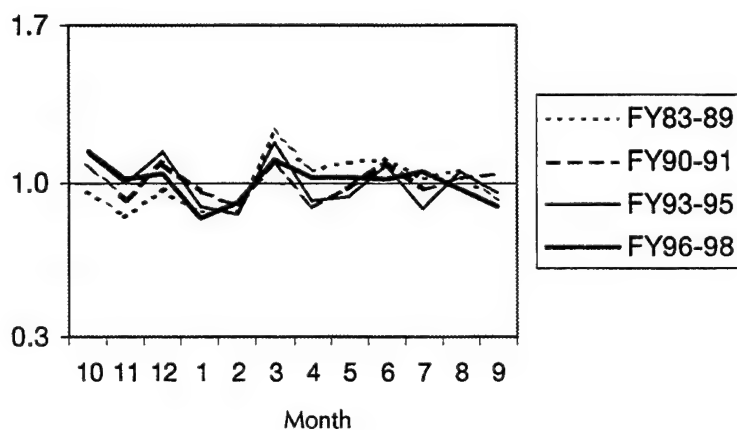
## Average Monthly E1-E4 Sea Fleet Losses at EAOS After an Extension



There is a distinct seasonal pattern for sea fleet losses as a result of leaving at one's EAOS after an extension of less than 24 months. The pattern is similar to that for EAOS losses after an enlistment because there is a surge in losses in the summer months. This is attributable to the fact that a disproportionate share of short-term extensions are for 12 months.

## Average Monthly E1-E4 Sea Fleet Losses to Attrition

Deviations from the mean (mean = 1.0)



Sea losses due to attrition remain fairly steady throughout the year.

## Decomposition of Seasonal Pattern in Monthly Sea Gains: E1-E4

---

Amount (percent) higher in Dec-May than Jun-Nov

	<u>FY83-89</u>	<u>FY96-98</u>
• <b>Sea gains:</b>	<b><u>475 ( 10%)</u></b>	<b><u>325 (13%)</u></b>
– Rotations from shore	55 ( 8%)	55 (12%)
– New accessions	<b>420 (10%)</b>	<b>270 (13%)</b>
• Includes both non-prior-service and prior service		

This slide shows the decomposition of sea gains. Rotations from shore account for only about 10 to 15 percent of the seasonal variation for both time periods.

## Decomposition of Seasonal Pattern in E1-E4 Sea Fleet Losses

---

Amount (percent) higher in Jun-Nov than Dec-May

	<u>FY83-89</u>	<u>FY96-98</u>
• Totals:	<u>50 ( 1%)</u>	<u>440 (19%)</u>
– EAOS loss after enlistment	155 (13%)	295 (47%)
– EAOS loss after extension	-10 ( -5%)	30 (16%)
– Rotation from shore	20 ( 2%)	-20 (-4%)
– Attrition	-35 (-3%)	15 ( 2%)
– Not classified	-75(-25%)	125 (46%)

This slide shows the breakdown of contributions to the seasonal pattern in sea losses. The June-November sea losses were 19 percent higher than December-May sea losses in FY96-98 (compared to only 1 percent higher in FY83-89). Most of the difference is attributable to EAOS losses after an enlistment.

## **If We Move Summer EAOSs to Off-peak, Will They Just Extend to the Summer?**

- **If so, policy changes won't work**
- **After reaching EAOS, off-peak E1-E4s have not historically extended to leave the Navy in the summer/fall:**
  - **Percentage leaving after an extension:**
    - Dec-May accessions: 24.3%
    - Jun-Nov accessions: 23.3%
  - **Percentage extending to different 6-month period from which they accessed:**
    - Dec-May accessions: 5.4%
    - Jun-Nov accessions: 4.7%

One potential drawback of the policies that move EAOSs forward or backward 6 months (to off-peak months) is that many of these sailors would just extend to the summer months. This would dampen the effectiveness of these policies because the sea losses would not change much.

To test whether sailors would extend to the summer months if their EAOSs were moved off-peak, we compared extension behavior at different times of the year for a sample of all sailors who left at EAOS after an enlistment or an extension. There was very little difference in the percentage of sailors who left after an extension for December-May accessions and June-November accessions. Furthermore, among extenders, December-May accessions were only slightly more likely to extend to the other 6-month period than June-November accessions. Thus, it does not appear that sailors with EAOSs coming up in off-peak months are much more likely to extend to peak months.

## **Appendix C:**

### **Additional Data on Within-Rating Seasonal Variation in E1-E4 Sea Gains and Sea Losses**

## Ratings With Greatest Amount of E1-E4 Seasonal Variation

<b><u>Rating</u></b>	<b><u>Seasonal variation</u></b>	<b><u># sea gains and losses</u></b>	<b><u>Seas. var./ (gains+losses)</u></b>
SN	239.2	936.8	0.26
AN	203.9	747.6	0.27
FN	52.4	434.9	0.12
HM	37.1	207.1	0.18
MM	24.8	230.6	0.11
OS	21.3	165.6	0.13
YN	19.3	65.1	0.30
EN	18.4	85.6	0.21

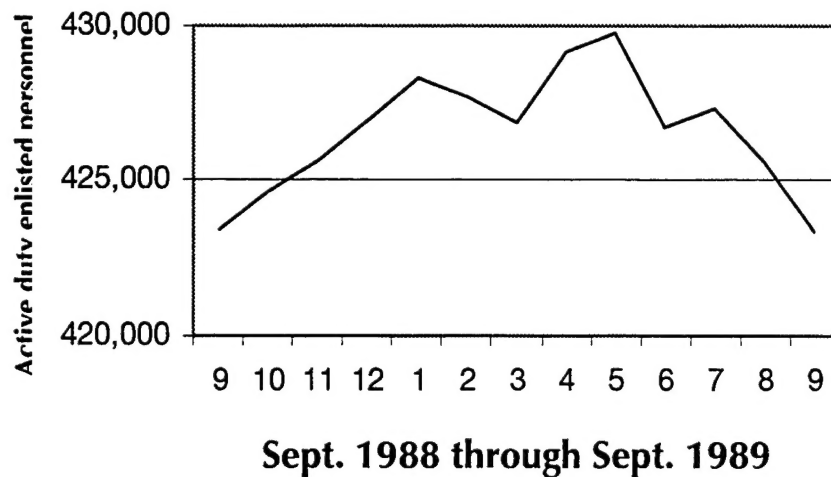
Note: Seasonal variation is measured as the difference in net gains between the December-May period and the June-September period.



**Appendix D:**

**The Effect of the Policies on  
Workyears and MPN Costs for a  
Given Endstrength**

## Typical Pattern of Enlisted Strength Over the Course of a Fiscal Year



This graph represents strength numbers from the end of FY88 to the end of FY89. We display the strength numbers for this year because it is the last one (besides the Desert Shield/Desert Storm year of 1991) for which endstrength was roughly the same from one year to the next. The more recent years have been transition years as the drawdown has caused almost continuous declines in strength levels.

The pattern appears to be that strength numbers peak around April-May, and the endstrength is lower than the average strength over the course of the year. The pattern is generally similar for other years. The main point from this chart is that the average strength does not necessarily equal the endstrength.

The steep declines in June-September indicate that more sailors are leaving than entering the Navy during these months.

## **Implications of the New Policies on Average Strength and Average LOS**

- **New policy options would affect MPN by:**
  - Decreasing average strength for a given endstrength
  - Raising or lowering average LOS (depending on obligation structure chosen)
- **Loss of average strength**
  - Increasing endstrength could offset loss in avg. strength
  - Endstrength increase can be sized to neutralize policy's effect on MPN
- **Change in average LOS**
  - The right mix of 3.5- and 4.5-year enlistments could neutralize policy's effect on MPN

The new policy options we present would affect the MPN budget in two ways. First, it would change the relationship between average strength and endstrength. Because the policy options shift losses from the summer months to the winter and spring months, average strength would probably be lower for a given endstrength. Second, depending on how many of the shifts were increases or decreases in obligation, the average LOS could change.

The effect of the policies on the MPN budget from a change in the average strength could be offset by increasing endstrength. In fact, the Navy could calculate the specific endstrength size that would neutralize the effect of the policies on average strength.

The new policies could increase or decrease average LOS, depending on the mix of 3.5- and 4.5-year enlistments. Again, the right mix could be found so that there would be no effect on the MPN budget.

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FF38	USNA ANNAPOLIS	
FF42	NAVPGSCOL MONTEREY CA	
FF44	NAVWARCOL NEWPORT RI	
FJA13	NAVPERSRANDCEN SAN DIEGO CA	
FJB1	COMNAVCRUITCOM MILLINGTON TN	
	Attn: 00	
	Attn: 00B	
	Attn: 35	
	Attn: 3522	
FT1	CNET PENSACOLA FL	
	Attn: TERRY HALVORSEN	
MISC	COMNAVSURFLANT	
	Attn: N1	

## OPNAV

N1B  
 N10  
 N12  
 N120  
 N120C5  
 N122  
 N13  
 N13B  
 N13T  
 N130  
 N132  
 N132C  
 N136